

Project Number: T-112-R-1

Project Title: Assessment of Herpetological Species in Greatest Need of Conservation (SGNC) in Illinois Bottomland Forests and Swamps

1. NEED

The U.S. Clean Water Act mandates protection of the physical, chemical, and biological integrity of wetlands. Despite the attention given to the “no net loss” of wetland acreage (quantity), much less political and management attention has focused on the ecological integrity (quality) of wetlands even though the wetland protection program requires measurable ecological performance goals as opposed to measuring acres of wetlands restored (NAS 2001; Mack 2007). The organisms inhabiting a natural ecosystem, both individually and as communities, are indicators of the actual conditions in that system since they are subject to the physical and chemical properties of the system as well as natural and human-caused variation (Ohio EPA 1988; Ohio EPA 1989).

Approximately 220 million acres of wetlands are estimated to have existed in the continental U.S. before 1700 (U.S. EPA 2003). Since that time, over half of the original wetlands have been drained and converted to other uses. This form of habitat loss has played a large role in the current biodiversity crisis that has received a great deal of attention over the past two decades. Extinction rates for plants and animals are estimated to be 1,000 times higher than background rates from the fossil record (Baillie et al. 2004). Of the vertebrate groups completely evaluated (birds, mammals, and amphibians), the IUCN found that 12% of all bird species, 21% of all mammal species, and 30% of all amphibian species were at risk of extinction (IUCN 2009). Further, while the assessment has only recently begun, it is believed an even greater percentage of reptiles are at risk of extinction (Gibbons et al. 2000; IUCN 2009). Although multiple factors have contributed to these declines, it is widely accepted that the primary threat facing wildlife is habitat loss and degradation (Cushman 2006).

Amphibian and semi-aquatic reptile (i.e., turtles and snakes that are wetland dependent) assemblages comprise critical ecological components of many wetland ecosystems. Amphibians play a large role in food webs as both predators of invertebrates and prey of larger vertebrates (Davic and Welsh 2004), and they often exceed the combined biomass of other terrestrial vertebrates within the system (Burton and Likens 1975; Peterman et al. 2008). Due to their unique life history cycle, amphibians can potentially supply a large proportion of the energy transfer between aquatic and terrestrial habitats (Gibbons et al. 2006). Within wetland ecosystems, many semi-aquatic reptiles are top predators and therefore a decline in their numbers can have serious consequences on ecosystem function (Reading et al. 2010). Additionally, amphibians and semi-aquatic reptiles can serve as useful bioindicators of environmental change because they are sensitive to various forms of environmental and habitat alteration (Storfer 2003; Gardner et al. 2007). Due to their importance in wetland ecosystems and their status as indicator taxa, amphibians and semi-aquatic reptiles can serve as models for understanding the roles that seasonal and semi-permanent wetlands play in ecosystem function.

Animals such as amphibians and semi-aquatic reptiles depend on wetlands for all or part of their life cycle, which means their survival is directly linked to the presence and ecological health of wetlands. In Illinois, 32 of the 41 amphibians and 47 of the 61 reptiles are wetland-dependent species (Phillips et al. 1999; U.S. EPA 2003). While the U.S. loses approximately 60,000 acres of wetlands each year (U.S. EPA 2004), more than 90% of original wetlands in Illinois have been lost for various land uses and most remaining wetlands have been degraded (Suloway and Hubbell 1994; IDNR 2005 - IWAP III. E.); therefore inventory, ecological assessment, and protection of wetlands is a high priority within the state (IDNR 2005). Wooded wetlands (bottomland forest ponds and swamps) are a critical ecological habitat concentrated in

southern Illinois (IDNR 2005 - IWAP Fig. 14) and are important to many species (IDNR 2005 - IWAP III. E. and F.). Amphibians and reptiles play critical roles in both aquatic and terrestrial habitats, reach their highest diversities in the wooded wetlands of southern Illinois (IDNR 2005 - IWAP III. B.), and serve as important ecological indicators of overall wooded wetland health and function. However, the distribution, abundance, and population trends of most amphibian and reptile SGNC are poorly understood, and data are lacking to quantify any potential declines in Illinois (IDNR 2005 - IWAP III. F.). Additionally, rigorous and repeatable sampling methods have not been developed for most amphibian and reptile SGNC (IDNR 2005 - IWAP III. F.). If the primary goals of the IWAP are to be achieved, then a field-based assessment of amphibian and reptile SGNC status and distribution is a crucial first step in developing long-term conservation plans for these taxa (IDNR 2005 - IWAP III. E. Wetlands Actions 1h, 3e, and III. F.). Further, an updated inventory of wetland habitat is needed (IDNR 2005 - IWAP III. E. Wetlands Action 3b), as well as additional research on the ecological aspects of high-quality wetland sites (IDNR 2005 - IWAP III. E. Wetlands Action 3c).

2. PURPOSE AND OBJECTIVES

The purpose of this project is to provide current information on the status of amphibian and reptile Species in Greatest Need of Conservation (SGNC) in southern Illinois bottomland forests and swamps within three Conservation Opportunity Areas (29 – LaRue-Pine Hills COA, Fig. 1; 30 – Eastern Shawnee COA, Fig. 2; 31 – Cache River-Cypress Creek COA, Fig. 3). The nine amphibian and reptile SGNC (and their associated habitats) to be evaluated are: Bird-voiced Treefrog, Mole Salamander, Wood Frog, Broad-banded Water Snake, Eastern Mud Turtle, Eastern Ribbon Snake, Mississippi Green Water Snake, Mud Snake, and Northern Copperbelly Water Snake (as per IDNR 2005 – IWAP Appendix 1). Funds approved through this grant will be used to:

- 1) Provide an ecological assessment of bottomland forest ponds and swamps in southern Illinois Conservation Opportunity Areas;
- 2) Provide updated status assessments of amphibian and reptile SGNCs in southern Illinois Conservation Opportunity Areas; and
- 3) Write and disseminate a final report for this project.

3. EXPECTED RESULTS OR BENEFITS

Expected outputs associated with this project include:

- 1) Maps of wetlands sampled to update wetland inventories in Illinois;
- 2) Ranking of all wetlands sampled based on amphibian and reptile SGNC and non-SGNC captured at each site (including species lists for each site and IDNR property sampled);
- 3) Established protocol to sample for amphibians and reptiles in bottomland forests and swamps;
- 4) Distribution maps for each of the nine target SGNC;
- 5) Maps of priority sampling locations for each of the nine target SGNC and overall herpetological species richness; and
- 6) A final report synthesizing all pertinent information.

This project will help meet the Desired Conditions for Illinois Wildlife and Habitat Resources in 2025 for SGNC by filling a critical information gap on the distribution and status of amphibians and reptiles in southern Illinois (IDNR 2005 - IWAP III B., C., F., and Appendix II). Project outputs will be directly applicable to Wetlands Campaign Actions 1h (information for recovery plans for rare and declining species), 3b (updated wetlands inventory), 3c (ecological aspects of high-quality wetlands), and 3e (status and distribution of amphibians and reptiles).

Additionally, our outputs will further initiatives in the Land and Water Stewardship Campaign by developing baseline information on wildlife and habitat resources (Action 2e) and serve as a source of best available science to guide future management decisions (Action 2f) for amphibian and reptile SGNC.

4. APPROACH

This project will be completed by research staff of the National Great Rivers Research and Education Center (NGRREC), East Alton, IL and the Illinois Natural History Survey (INHS), Champaign, IL. To assess and evaluate the current distribution and status of seven amphibian and reptile SGNC, we will sample three Conservation Opportunity Areas (COA) in southern Illinois. The 3 COAs to be sampled are: #29 (LaRue-Pine Hills, Fig. 1), #30 (Eastern Shawnee, Fig. 2), and #31 (Cache River-Cypress Creek, Fig. 3). The principal investigator from NGRREC and three co-principal investigators from INHS will conduct all surveys and analyses, as well as prepare and submit all reports. Up to 75 bottomland forest ponds and swamps will be sampled across the three COAs over three years ($n = 25$ sites per year). At each site, sampling surveys will be conducted during three separate time periods (Early Spring – March/April; Early Summer – May/June; Fall – September/October) to increase the probability of species detection. Additionally, due to fluctuations in population sizes, variability in activity patterns, and suspected detection rates between taxonomic groups (i.e. rare species have lower detection rates than common species), sites will be sampled for three nights per period ($n = 9$ total samples per site). By repeatedly sampling sites, we can estimate occupancy and detection rates.

Objective 1: Ecological assessment of bottomland forest ponds and swamps in Illinois.

Job 1a. Complete an inventory update of bottomland forest and swamp habitat in southern Illinois (IWAP III. E. Wetlands Action 3b).

In addition to the biotic data collected at each wetland site, we will also record data on the following environmental metrics: site coordinates, wetland size, wetland slope, fish presence/absence, and canopy cover. Upon completion of sampling for each of the 75 wetlands, the site coordinates (GPS waypoints for each wetland) will be used to create a wetlands map. This map will then be linked to an inventory list that includes the site attributes listed above (i.e., abiotic wetland measurements) as well as a herpetological species list for each wetland sampled.

Job 1b. Assess wetland site quality via herpetological diversity metrics (IWAP III. E. Wetlands Action 3c).

Wetland site quality will be assessed by the total number of SGNC captured as well as overall herpetological species richness. Specifically we will rank each of the 75 wetlands sampled for SGNC richness (i.e., total number of SGNC captured) and for overall herpetological species richness. The top 25 wetlands (for both SGNC and general richness) will be considered the highest quality wetlands (of the wetlands we sample). The next 25 wetlands will be ranked as intermediate wetlands, while the bottom 25 wetlands will be ranked as lower quality wetlands. This sampling and ranking methodology will yield insight into the distribution of higher quality wetlands for amphibians and reptiles in the three southern Illinois COAs.

Objective 2: Amphibian and reptile SGNC status assessments.

Job 2a. Develop and implement a sampling protocol for bottomland forest and swamp and reptile species (IWAP III. F.).

All sites will be sampled using passive sampling techniques to eliminate observer bias and aid in the standardization of a sampling protocol that can be repeated by future researchers. Each site will be sampled with three trap types: 1) unbaited minnow traps; 2) baited hoop traps, and 3) terrestrial pipe traps. Number of minnow traps deployed will be scaled to the size of the wetland (1 trap per 100 m²; minimum of 4 traps and maximum of 12 traps per wetland). Number of hoop traps deployed will be scaled to the size of the wetland (1 trap per 100 m²; minimum of 1 trap and maximum of 8 traps per wetland). At each wetland site, we will deploy 15 terrestrial pipe traps, all within 25 m of the wetland. All amphibians (adult, juvenile, and larvae) and reptiles (adult and juvenile) will be identified to species and assigned an age-class before being released at the point of capture. We will record the number of individuals per species captured in each sampling event. Results will be used to calculate diversity and abundance values for the amphibian and reptile assemblages at each wetland.

Job 2b. Quantify the status and distribution of amphibian and reptile SGNC in southern Illinois COAs (IWAP III. B., C., and F.).

Using the sampling methodology described in Job 2a (see above), SGNC distribution and status will be quantified for each species by site presence/absence across the 75 wetland sites. The repeated sampling design will allow us to generate detection estimates for each of the nine SGNC species (as well as all other amphibians and reptiles captured). Based upon our capture data, we will generate presence/absence distribution maps for each of the nine SGNC species, which will also serve to provide a status assessment of each of these species in the three southern Illinois COAs that we sample.

Job 2c. Identify priority areas for continued monitoring of amphibian and reptile SGNC in southern Illinois COAs (IWAP III. E.).

SGNC distribution and status will be quantified for each species by site presence/absence across the 75 sites (see Job 2b above), which will also allow for the designation of priority monitoring sites. We will recommend the top 10 priority monitoring sites based on total number of SGNCs captured at a site (i.e., of the 75 wetlands sampled, the top 10 in terms of total SGNCs captured will be recommended as continued monitoring sites in southern Illinois).

Objective 3: Finalize project.

Job 3a. Prepare a final report providing information for incorporation into wildlife action plan updates and to help guide future management decisions.

A final report containing all of the information generated for the two objectives (five jobs) mentioned above will be generated and submitted to the Illinois Department of Natural Resources and the United States Fish and Wildlife Service (as well as all other interested parties).

5. USEFUL LIFE

The grant funds supporting this project will not be used to purchase equipment or for capital improvements; therefore, the calculation of a useful life for the grant is neither possible nor applicable.

6. GEOGRAPHIC LOCATION

This project will occur within the LaRue-Pine Hills, Eastern Shawnee, and Cache River-Cypress Creek Conservation Opportunity Areas (Appendix A). Within the LaRue-Pine Hills COA, sites may include (but are not limited to): Horseshoe Lake-Alexander SFWA, Cape Bend SFWA, Union County SFWA, Trail of Tears SF, Lake Murphysboro, Kinkaid Lake SFWA, and Lovett's Pond. Within the Eastern Shawnee COA, sites may include (but are not limited to): Cave-in-Rock SP, Saline County SFWA, Lusk Creek Canyon SNA, Dixon Springs SP, Cretaceous Hills SNA, and Fort Massac SP. Within the Cache River-Cypress Creek COA, sites may include (but are not limited to): Sielbeck SF, Mermet Lake SFWA, Cache River SNA, and Cypress Pond SNA.

7. PRINCIPAL INVESTIGATORS

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8. PROGRAM INCOME

No program income will be generated as a result of this grant.

9. BUDGET NARRATIVE

Project Title: Assessment of Herpetological Species in Greatest Need of Conservation (SGNC) in Illinois Bottomland Forests and Swamps

Project Number: T-112-R-1

Project Time Frame: Start Date – 10/01/2016; End Date – 12/31/2019

Budget Categories	Federal Funds	Non-Federal Funds (1)	Total
Salaries and Wages			
Administrative/Professional	\$0.00	\$32,306.00	\$32,306.00
Academic / Graduate Hourly Wages	\$0.00	\$0.00	\$0.00
Other Title	\$0.00	\$0.00	\$0.00
Fringe Benefits			
Administrative/Professional	\$0.00	\$5,464.00	\$5,464.00
Academic / Graduate Hourly Wages	\$0.00	\$0.00	\$0.00
Other Title	\$0.00	\$0.00	\$0.00
Travel			
In-State			
Meals / Per Diem	\$19,200.00	\$0.00	\$19,200.00
Lodging	\$27,000.00	\$0.00	\$27,000.00
Mileage	\$15,600.00	\$0.00	\$15,600.00
Out-of-State			
Meals / Per Diem	\$0.00	\$0.00	\$0.00
Lodging	\$0.00	\$0.00	\$0.00
Mileage	\$0.00	\$0.00	\$0.00
International			
Meals / Per Diem	\$0.00	\$0.00	\$0.00
Lodging	\$0.00	\$0.00	\$0.00
Mileage	\$0.00	\$0.00	\$0.00
Equipment (2)			
	\$0.00	\$0.00	\$0.00
Materials and Supplies			
	\$8,338.00	\$0.00	\$8,338.00
Contractual Services			
	\$0.00	\$0.00	\$0.00
Other			
	\$0.00		\$0.00
Total Direct Costs	\$70,138.00	\$37,770.00	\$107,908.00
Modified Total Direct Cost (MTDC) (3)	\$70,138.00	\$37,770.00	\$107,908.00
Indirect Rate of 16 % (4)	\$11,222.08		\$11,222.08
Indirect Rate of 16.00 % (5)		\$6,043.20	\$6,043.20
Unrecovered Indirect Rate (20 % vs 16.00 % MTDC) (6)		\$0.00	\$0.00
Total Project Costs	\$81,360.08	\$43,813.20	\$125,173.28
Percentage of Total Project Cost	65.00%	35.00%	100.00%

Budget Justification

Salaries and Wages: No funds are requested for salary or wages. Match for this project will be provided in the form of partial salary for PI John Crawford. However, please note

that the other three PIs (A. Kuhns, C. Phillips, and M. Dreslik) will be working on this project as well (including fieldwork associated with this project).

Fringe Benefits: No funds are requested for fringe benefits. Match for this project will be provided in the form of fringe for J. Crawford's partial salary. However, please note that the other three PIs (A. Kuhns, C. Phillips, and M. Dreslik) will be working on this project as well (including fieldwork associated with this project).

Travel: We request \$61,800 for in-state travel. This figure includes: 1) mileage between Champaign and the study sites in a personal vehicle at a rate of \$0.40/mi and mileage between East Alton and the study sites in an NGRREC vehicle at a rate of \$0.40/mi (1300 total miles per week for 30 weeks) = \$15,600; 2) 3 hotel rooms @ \$100/night for 3 nights/week for 30 weeks = \$27,000; and 3) per diem for 4 people @ \$40/day for 4 days/week for 30 weeks = \$19,200. Travel for this project will require PIs to travel from NGRREC (East Alton, IL) and INHS (Champaign, IL) to study sites in southern IL and the necessary sampling protocol (sampling for 4 days per week) will require overnight stays (necessitating lodging and per diems). Again, note that all four PIs (J. Crawford, A. Kuhns, C. Phillips, and M. Dreslik) will be working on this project, which requires multiple hotel rooms and per diems per week for travel to complete the required field sampling.

Equipment: N/A.

Materials and Supplies: The \$8,338 in supplies will be used to purchase 1) Minnow traps (245 traps @ \$8.00/trap = \$1,960); 2) Hoop traps (190 traps @ \$14.00/trap = \$2,660); 3) Pipe traps (480 traps @ \$4.00/trap = \$1,920); 4) Bait (cans of sardines = \$750); 5) Bungee cords for pipe traps (718 bungee cords @ \$1.00/cord = \$718); and 6) Trap containers to transport and store traps (30 containers @ \$11.00/container = \$330). All of these materials are needed to sample for the nine different target SGNC amphibians and reptiles in this project.

Contractual Services: N/A.

Other: N/A.

10. MULTIPURPOSE PROJECTS

This is not a multi-purpose project.

11. RELATIONSHIP WITH OTHER GRANTS

This project has no relationship with any other known federally funded project that is planned, anticipated, or underway.

12. TIMELINE

	<i>Oct.- Dec. 2016</i>	<i>Feb.- May 2017</i>	<i>June- Sept. 2017</i>	<i>Oct.- Dec. 2017</i>	<i>Feb.- May 2018</i>	<i>June- Sept. 2018</i>	<i>Oct.- Dec. 2018</i>	<i>Feb.- May 2019</i>	<i>June- Sept. 2019</i>	<i>Oct.- Dec. 2019</i>
<i>Job 1a.</i>										
<i>Job 1b.</i>										

Job 2a.										
Job 2b.										
Job 2c.										
Job 3a.										

13. GENERAL

(i) **Substantial in Character and Design**

The project statement describes a need consistent with the State Wildlife Grants (SWG); states a purpose and sets objectives, both of which are based on the need; uses a planned approach, appropriate procedures, and accepted principles of fish and wildlife conservation and management, research and is cost effective.

(ii) **Compliance**

The IDNR will use its CERP (Comprehensive Environmental Review Process) as a tool to aid the Department in meeting NEPA compliance for the project outlined under this grant proposal. It is the Department's policy to require CERP applications for all land disturbing activities unless those activities are covered by CERP exemptions.

All planned activities will also be in compliance with the Endangered Species Act. All determinations and documentation will be in accordance with the current established U.S. Fish and Wildlife Service protocols for section 7.

All planned activities will be in compliance with the National Historic Preservation Act and the Council on Historic Preservation Act. All determinations and documentation will be in accordance with the terms of the Programmatic Agreement, as amended, effective September 23, 2002.

When applicable, those planned activities which involve a floodplain and/or jurisdiction wetlands will be done in accordance with Presidential Executive Orders 11988 and 11990.

When applicable, those planned activities which involve programs and/or site improvements will be done in accordance with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act.

When applicable, those planned activities which involve the use of pesticides, herbicides

or

other comparable chemicals will be done in accordance with current state and federal regulations to assure the safe and legal application of those chemicals. All chemicals will be applied in accordance with the manufacturers label instructions. All persons applying chemicals will be licensed by the Illinois Department of Agriculture as a chemical operator along with a licensed applicator, in accordance with Illinois state law.

APPENDIX A. SUPPLEMENTAL DOCUMENTS

Literature Cited

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Narrative Figures

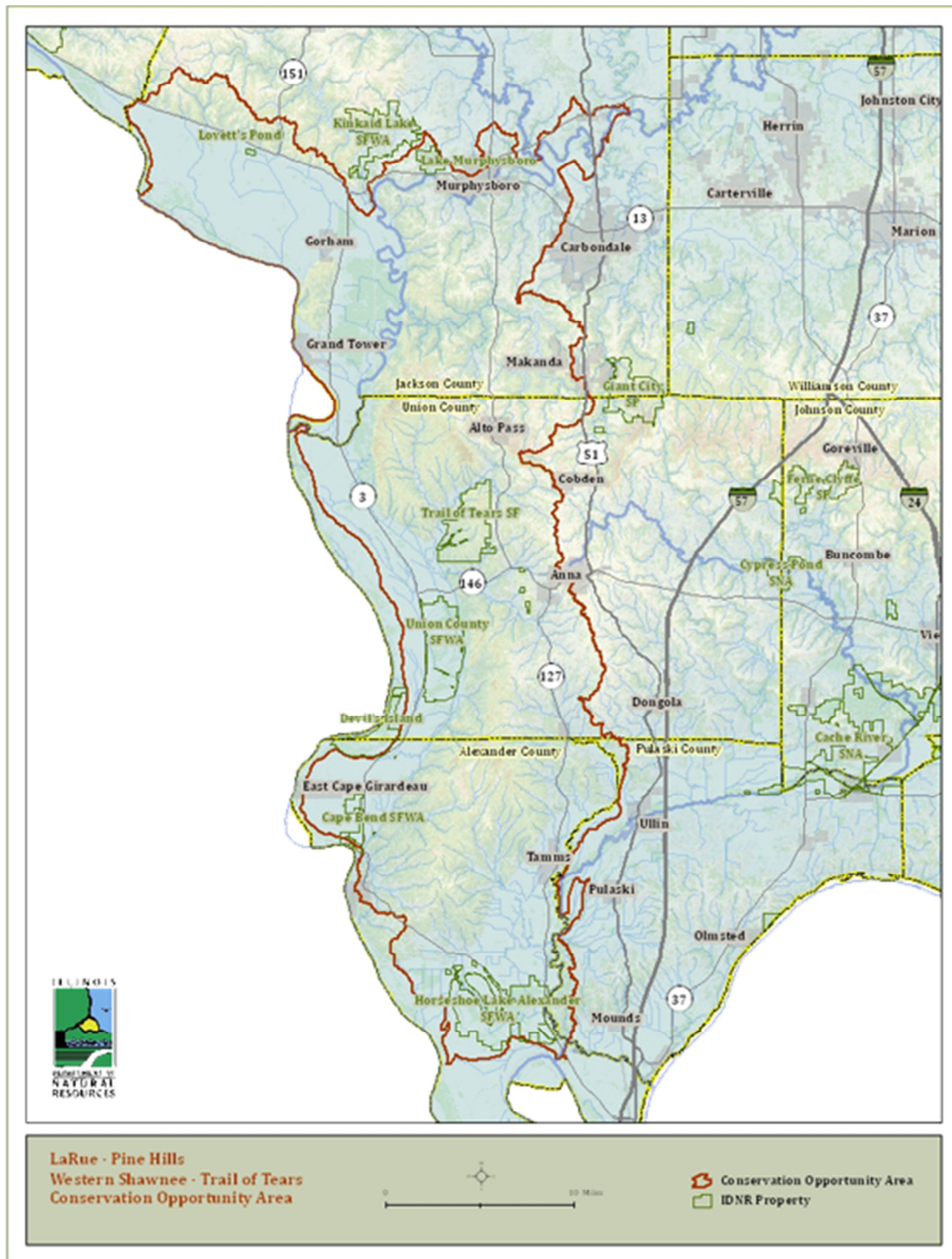


Figure 1. State managed properties within the LaRue-Pine Hills Conservation Opportunity Area. Map taken from <http://www.dnr.illinois.gov/conservation/IWAP/Pages/LaRue-PineHills.aspx>

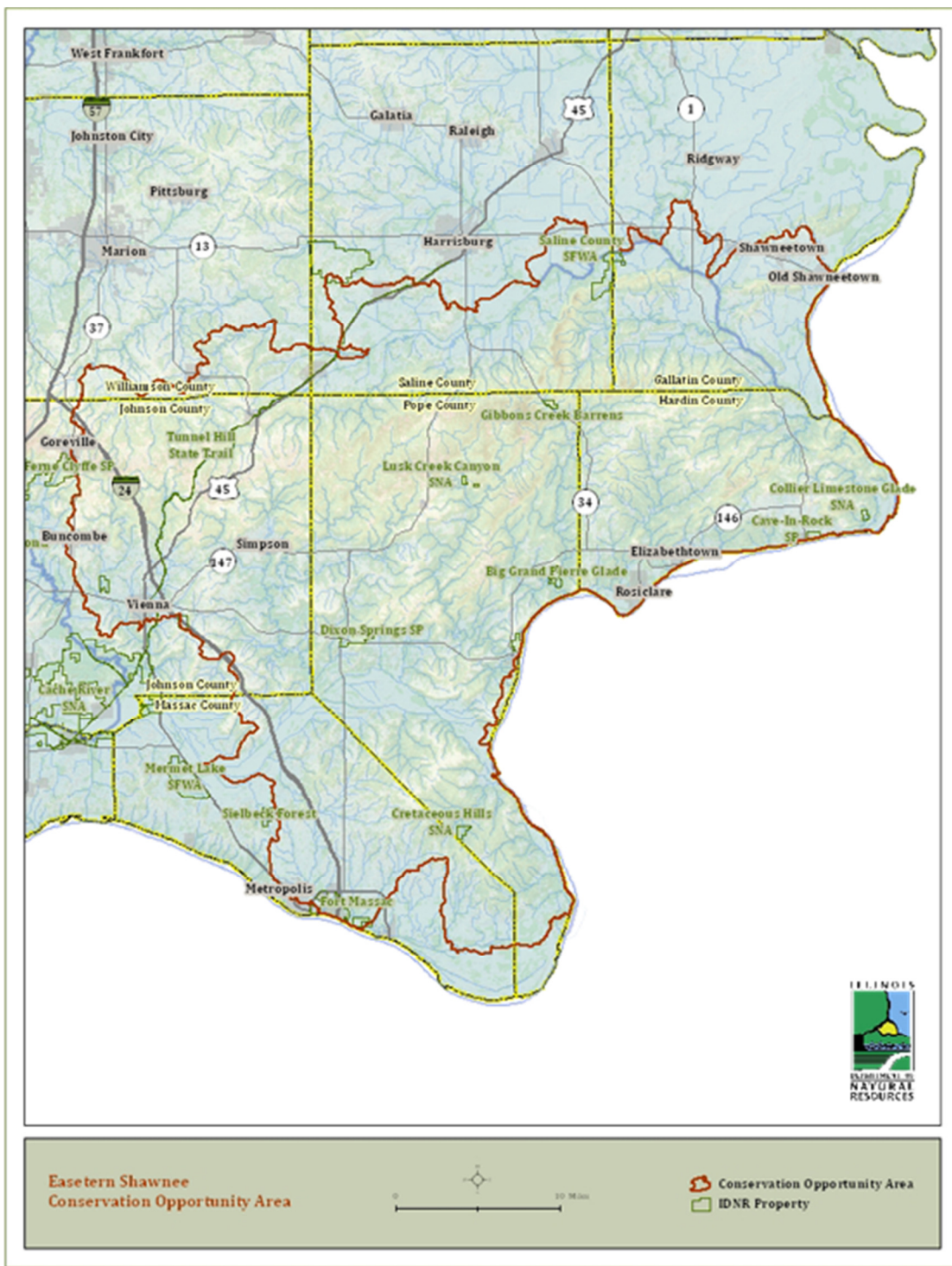


Figure 2. State managed properties within the Eastern Shawnee Conservation Opportunity Area. Map taken from <http://www.dnr.illinois.gov/conservation/IWAP/Pages/EasternShawnee.aspx>

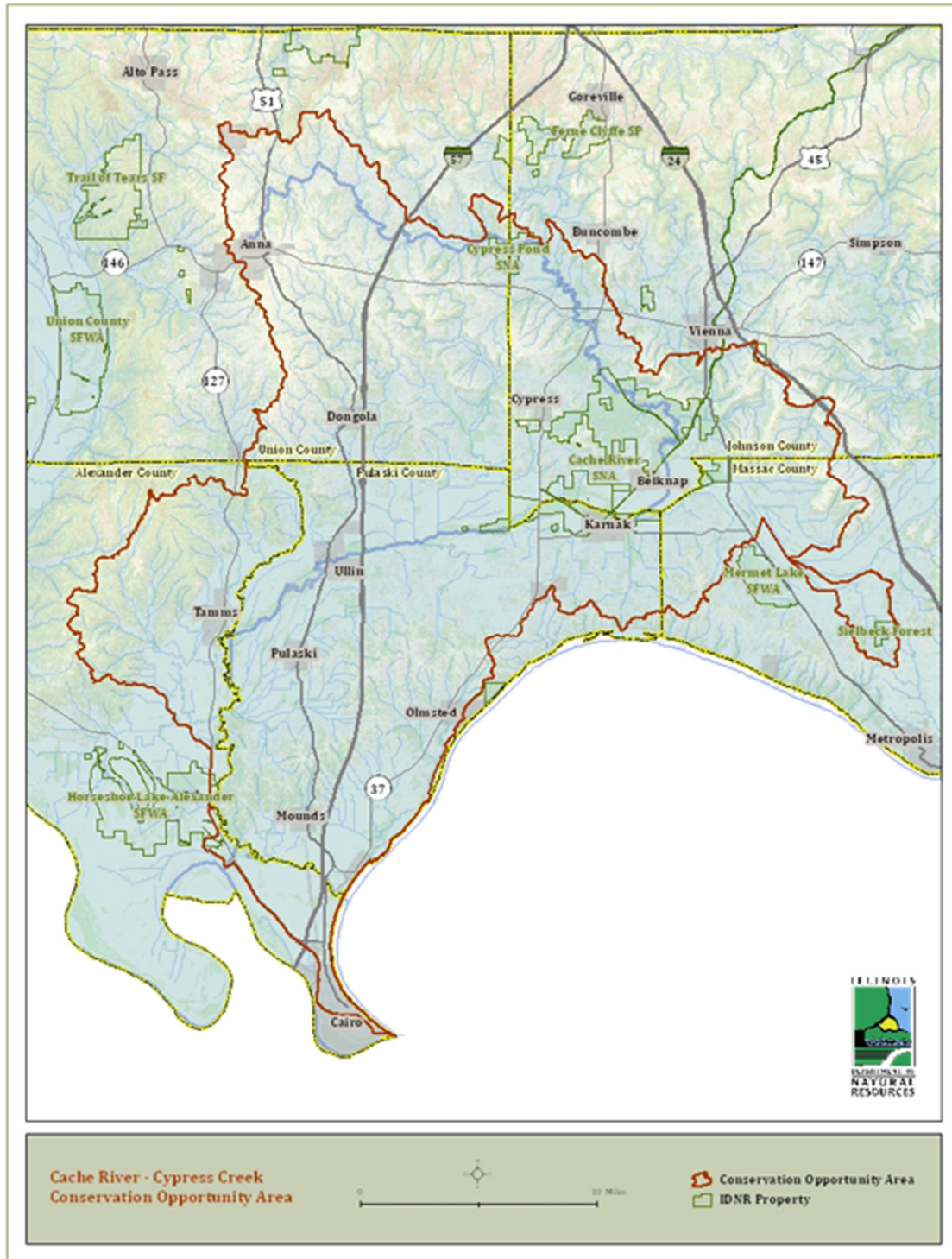


Figure 3. State managed properties within the Cache River-Cypress Creek Conservation Opportunity Area. Map taken from <http://www.dnr.illinois.gov/conservation/IWAP/Pages/CacheRiver-CypressCreek.aspx>